

Thysanoptera from the Nilgiri and Kodaikanal Hills (South India)

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(With six figures)

The Nilgiri and Kodaikanal hill ranges of south India constitute a favourable collecting ground for Thysanoptera in view of their rich vegetation, both natural and introduced. Aid given by the Sir Dorabji Tata Memorial Trust through the Bombay Natural History Society enabled the author to make a survey of the Thysanoptera of this area, the results of which form the basis of this paper. Apart from the discovery of a new genus *Aroidothrips*, some of the rarer genera as *Bolacothrips* Priesner, *Apterygothrips* Priesner, and *Stictothrips* Hood were recorded, their corresponding species being new. In addition, *Ramaswamiahiella kallarensis* sp. nov. and *Dolichothrips (Dolicholepta) rambhutanae* sp. nov. are described and records new to the Indian region, such as *Haplothrips euphorbiae* Priesner and *Sericothrips occipitalis* Hood, are included.

Several species of horticultural importance causing severe damage to the flowers of such plants as carnations, gladiolus, orchids, iris, asters, hollyhocks, and a host of others listed below, mostly introduced into our mainland and thriving generally at high altitudes in extensive and well-maintained gardens, have been recorded during the course of the present study. The role played by thrips in causing serious economic losses to horticulturists is a recognised fact abroad, but no record exists in India of the intensity of thrips infestation on ornamental plants. Besides the presence of casual visitors and others of minor importance as pests, the following species deserve special mention as proving destructive to flowers or having sufficient potentialities of becoming serious pests: *Thrips tabaci* Lindeman on carnations, *Thrips florum* Schmutz, *Thrips melaneurus* Bagnall, and *Thrips palmi* Karny on different species of roses, *Thrips nilgiriensis* Ramakrishna on orchids, *Taeniothrips simplex* Morrison on gladiolus, *Haplothrips gowdeyii* (Franklin) and *Trybomiella ramakrishnai* Karny on hollyhocks, canna, etc. No information is available on thrips infesting glass houses in India; attempts to collect them from the few

glass houses at Ootacamund proved futile, the only species obtained being *Heliothrips haemorrhoidalis* (Bouche) from flowers of begonia.

LIST OF SPECIES RECORDED

Suborder TEREBRANTIA Haliday

- Sericothrips graminis* Ananthakrishnan
Sericothrips occipitalis Hood
Aptinothrips rufus (Gmelin)
Scirtothrips dorsalis Hood
Anaphothrips (Neophysopus) flavicinctus (Karny)
Exothrips madrasensis Ananthakrishnan
Ramakrishnothrips jonnaphila (Ramakrishna)
Ramakrishnothrips cardamomi (Ramakrishna)
Frankliniella sulphurea Schmutz
Taeniothrips distalis Karny
Taeniothrips simplex (Morrison)
Aroidothrips longistylus gen. et sp. nov.
Bolacothrips bicolor sp. nov.
Ramaswamihiella kallarensis sp. nov.
Thrips florum Schmutz
Thrips tabaci Lindeman
Thrips parvus Schmutz
Thrips apicatus Priesner
Thrips nilgiriensis Ramakrishna
Thrips bambusae Shumsher
Thrips melaneurus Bagnall
Thrips palmi Karny
Heliothrips haemorrhoidalis Bouche
Heliothrips kadaliphila (Ramk. & Marg.)
Caliothrips indicus (Bagnall)

Suborder TUBULIFERA Haliday

- Stictothrips fimbriata* (Ananthakrishnan)
Hoplothrips indicus sp. nov.
Bamboosiella bicoloripes Ananthakrishnan
Haplothrips (Trybomiella) ramakrishnai Karny
Haplothrips gowdeyii (Franklin)
Haplothrips euphorbiae Priesner
Xylaplothrips pictipes Bagnall
Dolichothrips (Dolicholepta) rambhutanae sp. nov.
Praepodothrips indicus Priesner & Seshadri
Praepodothrips priesneri Ananthakrishnan

Praepodothrips cymbopogoni Ananthakrishnan

Apterygothrips pini sp. nov.

Gynaikothrips karnyi Bagnall

Gynaikothrips interlocatus Karny

Cercothrips tibialis Zimmerman

***Sericothrips graminis* Ananthakrishnan**

1956. *Sericothrips graminis* Ananthakrishnan, T. N. in Zool. Anz. **156** : 31-33.

NILGIRIS : Coonoor, Sims Park 5500', 2 females on grass, 10-5-1959.

A typical grass inhabiting bicolorous species with abdominal segments I-V yellow and VI-X dark grey-brown. Longitudinal vein of forewing with 24 bristles.

***Sericothrips occipitalis* Hood**

1917. *Sericothrips occipitalis* Hood, J. D. in Bull. Brook. Ent. Soc. **12** (2) : 32-34.

NILGIRIS : Burliar Fruit Research Station 2500', 8 females and 4 males on leaves of *Pueraria phaseoloides*, 8-5-1959.

This species is a new record to India and is allied to *S. graminis* Ananthakrishnan, with 3 abdominal segments predominantly yellow. Foreangles of pronotum produced acutely and reticulations on occiput and pronotal area outside plate, distinctly net-like.

***Aptinothrips rufus* (Gmelin)**

1788. *Thrips rufa* Gmelin, Caroli Linn. Syst. Nat. : 2224.

1836. *Aptinothrips rufa* Haliday, A. H. in Ent. Mag. **3**.

1902. *Aptinothrips rufa* Hinds, H. E. in Proc. U.S. Nat. Mus. **26**.

1935a. *Aptinothrips rufus* Speyer, E. R. in Trans. R. Ent. Soc. Lond. **8** : 483-508.

NILGIRIS : Pomological Station, Coonoor 5500', 6 females on grass, 10-5-1959.

Though this is a typical grass-infesting form common throughout Europe, U.S.A., Egypt, Chile, etc., it has not so far been recorded from India on grasses as far as the available literature shows. However, *Aptinothrips rufus* var. *connaticornis* Bagnall has been recorded from Darjeeling in tea flowers.

Scirtothrips dorsalis Hood

1919. *Scirtothrips dorsalis* Hood, J. D. in Insec. Inscit. Menstr. 7 : 90-91.

1932. *Scirtothrips dorsalis* Ramakrishna, T. V. in Agr. Livestk. Ind. 2 (4) : 393-394.

NILGIRIS : Kallar Fruit Research Station 1500', 6 females on flowers of wood apple, 8-5-1959.

Anaphothrips (Neophysopus) flavicinctus (Karny)

1912. *Euthrips flavicinctus* Karny, H. H. in Marcellia 11 : 115.

1913. *Neophysopus medioflavus* Schmutz in Sitz. Akad. Wiss. Wien. 112 : 1017.

1919. *Euthrips citricinctus* Bagnall, R. S. in A. M. N. H. (9) 4 : 270.

1925. *Anaphothrips flavicinctus* Karny, H. H. in Ark. Zool. 17 : 17.

1928. *Anaphothrips (Euthrips) citricinctus* Ramakrishna, T. V. in Mem. Dept. Agr. Ind., Ent. ser., (7) 10 : 269.

NILGIRIS : Coonoor Pomological Station 5500', numerous females on grass, 10-5-1959. KODAIKANAL : Shembaganur, Sacred Heart College 5000', numerous females on grass, 5-6-1959.

One of the commonest species of grass-inhabiting thrips, this species exhibits alary polymorphism, with macropterous, brachypterous, and apterous individuals. Only 4 brachypterous and 2 apterous females were collected, the rest being macropterous.

Exothrips madrasensis Ananthakrishnan

1956. *Exothrips madrasensis* Ananthakrishnan, T. N. in Zool. Anz. 157 : 130-132.

NILGIRIS : Coonoor Pomological Station 5500', 2 females on grass, 10-5-1959.

Ramakrishnothrips jonnaphila (Ramakrishna)

1928. *Taeniothrips jonnaphila* Ramakrishna in Mem. Dep. Agri. Ind., Ent. ser., (7) 10 : 256-258.

1940. *Physothrips jonnaphila* Ramakrishna, Cat. Ind. Insects, pt. 25 : 21.

1942. *Ramakrishnothrips jonnaphila* Shumsher in Indian J. Ent. 4 (2) : 6-7.

1945. *Ramakrishnothrips jonnaphila* Shumsher, ibid. 7 : 154.

KODAIKANAL : Perumalmalai Hills 5500', numerous males and females on leaf-sheaths of *Sorghum* and wild cane, 5-5-1959.

The above species is distinguished from *R. cardamomi* (Ramakrishna) by the absence of a comb on the VIII abdominal segment, costa of forewing with 24-28 bristles and lower vein with 13-14 bristles.

Ramakrishnothrips cardamomi (Ramakrishna)

1935. *Taeniothrips cardamomi* Ramakrishna in Bull. Ent. Res. 26: 35-38.

1942. *Ramakrishnothrips cardamomi* Shumsher in Indian J. Ent. 4 (2) : 6-7.

1945. *Ramakrishnothrips cardamomi* Shumsher, *ibid.* 7 : 154.

NILGIRIS : Burliar Fruit Research Station 2500', numerous males and females on leaf-sheaths and leaves of cardamom, 8-5-1959. KODAIKANAL : Numerous males and females inside leaf-sheaths of Cannaceae, Bryant's Park, 4-6-1959.

This species is characterised by the presence of a comb on the VIII abdominal segment, costa of forewing with 14 or 15 bristles and lower vein with 5 bristles.

Frankliniella sulphurea Schmutz

1913. *Frankliniella sulphurea* Schmutz in Sitz. Akad. Wiss. Wien. 112 : 1019.

KODAIKANAL : Bryant's Park 6500', numerous females on *Chrysanthemum* flowers and flowers of *Hibiscus*, 4-6-1959.

This is one of the commonest flower-infesting thrips having a very wide distribution and extremely polyphagous habit.

Taeniothrips distalis Karny

1913. *Taeniothrips distalis* Karny, H. H. in Archiv. F. Naturgeschichte: 122.

1916. *Taeniothrips distalis* Bagnall, R. S. in A. M. N. H. (8) 17: 218.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', 2 females on Papilionaceous flowers, 11-5-1959.

Taeniothrips simplex (Morrison)

1930. *Physothrips simplex* Morrison, G. D. in Bull. Ent. Res. 21 (1) : 12-13.

1938. *Taeniothrips simplex* Bailey, S. F. in Univ. Calif. Col. Agri. Expt. Sta. 346 : 50-52.

NILGIRIS : Raj Bhavan Gardens 7000', several females on *Gladiolus* flowers and leaves, 11-5-1959. KODAIKANAL : Shembaganur, Sacred Heart College Gardens 5000', numerous females on *Gladiolus* flowers and leaves ; Mt. St. Mary's 7500', numerous females on *Gladiolus* flowers, 5-6-1959.

The *Gladiolus* thrips is a cosmopolitan form known from widely separated countries of the world and presumably introduced into India with corms, in view of their ability to reproduce on their surface. Unlike *Thrips tabaci*, this has a very limited host range and of the several plants examined its presence was recorded only from *Gladiolus* primarily and on carnations and iris occasionally. That this is assuming major pest proportions is evident from the fact that in several *Gladiolus* plants badly damaged flower buds were observed which failed to open. In the otherwise red or purple petals of the flowers, bleached areas or irregular silvery patches appeared due to the feeding of the adults and larvae in considerable numbers.

Genus AROIDOTHRIPS gen. nov.

Body slender. Head wider than long, transversely reticulate at base ; eyes large, occupying $\frac{3}{4}$ head length. Antenna 8-jointed, long and thin, 3.7 times head length ; joint 2 of style $2\frac{1}{2}$ to 3 times as long as joint 1 ; sense cones on 3 and 4 forked, long and stout ; antennal joints densely setose. Mouth cone short and blunt, maxillary palp 3-jointed. Prothoracic bristles very well developed, outer postangulars much longer than inner ; anteroangulars shorter than anteromarginals. Wings present, normal ; bristles and veins well developed, the lower vein with a continuous series. Lateral portions of abdominal tergites without net sculpture. Apex of abdomen not tubiform or unusually narrowed.

This new genus is closely allied to *Ayyaria* Karny and *Diarthrothrips* Williams but differs from them in the 3-jointed maxillary palpi, the nature of the antennal style and the sense cones.

Aroidothrips longistylus sp. nov.

Macropterous female :

General colour yellow with plenty of grey areas. Antennal joints uniform grey, sense cones pale. Head and thorax yellowish grey ; pterothorax dark yellow mesad, greyish yellow at sides ; abdominal segments II-VIII at anterior margins with bands of light grey pigments and with little red pigment mesad ; anterior and posterior borders of

prothorax with red pigment. Forewings uniform grey-brown ; bristles not hyaline, dark.

Head wider than long, $147\ \mu$ across eyes, $126\ \mu$ at base and $105\ \mu$ long (Fig. 1A). Eyes large, $70\ \mu$ long and equally wide. Cheeks with weak setae and head at base with transverse striae. Antenna very characteristic (Fig. 1a), 3.7 times head length, with a long, fine style, the terminal joint of which is $2\frac{1}{2}$ to 3 times as long as joint 1 ; joint 4 long and bottle-like ; sense cones on 3 and 4 forked, long and stout, that on 3, $54\ \mu$ long and $22\ \mu$ between arms, that on 4, $64\ \mu$ long and $18\ \mu$ between arms ; antennal joints : length (width) in μ : 26-32 (29), 35-38 (29), 61 (26-29), 87-90 (26), 55-58 (19), 58-67 (18), 10 (6), 25-29 (4) ; setae on antennal joints very well developed, long and pointed, measuring 48-58 μ long and disposed as in the figure. Mouth cone short and blunt ; maxillary palp 3-jointed, $45\ \mu$ long, individual joints measuring 19, 10, and $16\ \mu$ long respectively.

Prothorax $126\ \mu$ long, $140\ \mu$ wide at anterior margin and $168\ \mu$ across posterior margin. Prothoracic bristles very well developed ; antero-angulars shorter, $32\ \mu$ long, anteromarginals $51\ \mu$ long ; outer and inner postangulars $19\ \mu$ and $58\ \mu$ long respectively ; lateral margins on scale with smaller bristles, 19-22 μ long.

Forewings $700\ \mu$ long, $70\ \mu$ wide at base, $42\ \mu$ at middle and $35\ \mu$ tip.

Chaetotaxy : costa, 24 ; upper vein, 6 at base and 1 at tip ; lower vein, 11 in a row. Wing bristles well developed ; costal bristles $51\ \mu$ long ; basal lower vein bristles $48\ \mu$ long, distal one $67\ \mu$ long ; fringes $252\ \mu$ long.

Abdomen at base uniformly wide, $210\ \mu$; abdominal tergites devoid of lateral polygonal reticulations ; bristles of IX : outer 78, middle 102, and inner $112\ \mu$ long ; bristles of X : inner 99, outer $67\ \mu$ long.

Total body length 1.4 mm.

KODAIKANAL : Bryant's Park 7000', 2 females on Arum lily (*Richardia* sp.) flowers, 6-6-1959.

Genus **BOLACOTHRIPS** Uzel

1895. *Bolacothrips* Uzel, H. in Mon. Ord. Thys. : 212.

This genus is being recorded for the first time in India and is characterised by the slender body, simple sense cones, 7-jointed antenna, 2 pairs of postocellar bristles and posterior prothoracic angles with a pair of bristles of about equal length.

Bolacothrips bicolor sp. nov.

Macropterous female :

Body bicolorous ; head and thorax yellow, with a greyish tinge ; antennae and abdomen brown. Wings pale at basal third, dark brown at middle, and pale brown at apex.

Head 112 μ long from fore margin of eyes, about as wide across eyes. Eyes well developed, postoculars 60 μ long, pointed. Antenna 7-jointed (Fig. 2), joints 3-7 measuring length (width) in μ : 45 (19), 45 (22), 38 (19), 49 (19), 16 (10). Sense cones on 3 and 4 simple. Mouth cone broadly rounded, 96 μ long, 80 μ wide at base, reaching beyond the middle of the prosternum. Maxillary palp 3-jointed, 38 μ long, individual joints measuring 13, 10, and 16 μ long respectively.

Prothorax 168 μ long with numerous well-developed bristles on scale. Anteromarginals 48 μ long ; outer postangulars 83 μ , inner 80 μ long. Pterothorax 280 μ long and 224 μ wide. Forewings 714 μ long, 64 μ wide at base, 48 at middle, and 35 at tip. Chaetotaxy: costa 22 ; upper vein, 6 at base and 1+1+1 beyond base ; lower vein 10 in a row.

Abdomen broad at base distinctly narrow at apex. Bristles of IX : outer 128, middle 196, and inner 64 μ long. Bristles of X : outer 90 and inner 105 μ long.

Total body length 1.4 mm.

KODAIKANAL: Bryant's Park 7000', 1 female on *Agapanthus* flowers, 6-6-1959.

This is the only bicolorous species of *Bolacothrips* and hence easily distinguishable from the other species, *B. jordani* Uzel, *B. orientalis* Priesner, and *B. africanus* Faure.

Genus RAMASWAMIAHIELLA Karny

1926. *Ramaswamiahiella* Karny, H.H. in Mem. Dept. Agr. Ind., Ent. ser., (6) 9 : 208.

The genus *Ramaswamiahiella* is distinctly separated from the genus *Thrips* by the posterior margin of the sternites possessing at least 6 pairs of bristles.

Ramaswamiahiella kallarensis sp. nov.

Macropterous female :

General colour yellowish grey.

Antennal joint 1 pale, 2 dark grey, 3-7 yellowish grey. Wings pale greyish infumate ; abdomen uniform greyish brown.

Head wider than long, 126 μ wide and 84 μ long. Eyes large, 56 μ long and 42 μ wide. Antenna nearly 2.7 times head length ; antennal joints length (width) in μ : 22 (26), 32 (22), 35 (19), 38 (19), 35 (16), 45 (16), 13 (6).

Prothorax 140 μ wide across anterior margin 154 μ wide at posterior margin ; outer and inner postangular prothoracic setae 32 and 38 μ long respectively. Pterothorax as long as wide, 210 μ long. Wings 750 μ

long, 70 μ wide at base; chaetotaxy : costa 27 ; upper vein 3+3 ; lower vein 16 in a row.

Abdominal segments broad at base gradually narrowed at apex. Bristles of IX : outer 64, middle 83, and inner 73 μ long. Bristles of X : inner 73 and outer 76 μ long.

Total body length 1.162 mm.

NILGIRIS : Kallar Fruit Research Station 1500', 1 female on flowers of wood-apple among females of *Scirtothrips dorsalis*, 8-5-1959.

The present species differs from the only hitherto known species *subnudula* Karny by the larger size of the body and the difference in the chaetotaxy of the wings, particularly in the upper and lower veins. *R. subnudula* is a minute form measuring 0.75 to 0.95 mm.

***Thrips florum* Schmutz**

1913. *Thrips florum* Schmutz in Sitz. Akad. Wiss. Wien. **122** : 1003.

1942. *Thrips florum* Karny, H.H. in Arkiv. Zool. **17** : 15.

1934. *Thrips florum* Priesner, H. in Natur. Tidschr. Neder. Inde. **94** : 261.

1940. *Thrips florum* Ramk. & Marg. in Cat. Ind. Insects, pt. 25 : 21-22.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', several males and females on different species of roses, *Anemothercum*, *Hibiscus* flowers, and numerous other flowers of ornamental value (*vide infra*), and knol-kohl leaves, cabbage leaves, etc., 11-5-1959. KODAIKANAL : Shembaganur, Sacred Heart College Gardens 5500', numerous females in flowers of *Agapanthus*, *Antirrhinum*, *Hibiscus*, *Crotalaria*, etc. ; Mt. St. Mary's 7500', in flowers of *Iris*, *Anemothercum*, *Antirrhinum*, *Geranium*, *Verbena*, and different species of roses.

***Thrips parvus* Schmutz**

1913. *Thrips parvus* Schmutz in Sitz. Akad. Wiss. Wien. **122** : 1004.

1926. *Thrips parvus* Karny, H. H. in Mem. Dep. Agri. Ind., Ent. ser., **6** : 199.

1934. *Thrips florum* Priesner, H. in Natur. Tidschr. Neder. Ind. **94** (3) : 268-269.

NILGIRIS : Burliar Fruit Research Station 2500', 2 females on *Bauhinia* flowers, 8-5-1959.

This species is closely related to *Thrips florum* differing from it in the 3rd antennal joint being shorter than the 6th and the upper vein of forewing with 2 distal bristles while in *T. florum* the 3rd antennal joint is as long as 6 and upper vein has 3 distal setae.

Thrips apicatus Priesner

1934. *Thrips apicatus* Priesner, H. in Natur. Tidschr. Neder. Ind. 94 (3) : 264.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', female on knolkohl leaves, 11-5-1959. KODAIKANAL ; Shembaganur, Sacred Heart College 5500', numerous females on *Acacia podalyriaefolia* flowers, 5-6-1959.

This species has been hitherto known only from a single female collected on *Acacia* from Guntur and described by Priesner.

Thrips tabaci Lindeman

1888. *Thrips tabaci* Lindeman in Die Schadl. Ins. Tabac, 15.

1902. *Thrips tabaci* Hinds, W. E. in Proc. U.S. Nat. Museum 26 : 178-194.

1932. *Thrips tabaci* Ramakrishna, T. V. in Agr. & Livestk. Ind. 2 (4) : 394-395.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', numerous males and females on carnations, 11-5-1959. KODAIKANAL : Mt. St. Mary's 7500', on carnations numerous males and females; also on *Verbena venosa*, *Rosa bankia*, *Osbeckia*, *Agapanthus*, *Iris*, etc., 5-6-1959.

This species has a very wide distribution and is extremely polyphagous. The damage wrought by them to carnations in India has hitherto been unnoticed in spite of the attention it has received as the most harmful injurer in Europe, Britain, and the United States. The damage is evident from the numerous pale and blotched areas on the otherwise continuous beds of red and pink flowers. The flowers become dry and wrinkled and fade owing to heavy infestation. The early signs are the blotching of petals becoming white or silvery and subsequently turning light grey and finally brown. All the parts of the flowers were found to be attacked and several adults and larvae were observed inside each flower.

Thrips nilgiriensis Ramakrishna

1928. *Thrips nilgiriensis* Ramakrishna, T. V. in Mem. Dep. Agri. Ind., Ent. ser., (7) 10 : 262-263.

1940. *Thrips nilgiriensis* Ramakrishna, T. V. & Margabandhu, V. in Cat. Ind. Insects, pt. 25 : 23.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', numerous females and males in flowers of broad beans (*Fabia vulgaris*) and flowers of peaches, plums, etc. 11-5-1959. KODAIKANAL : Shembaganur, Sacred

Heart College 5500', numerous females in orchid flowers, *Habenaria*, *Cypripedium*, and *Dendrobium gratiosissimum*. Mt. St. Mary's 7500', on carnations, Avocado inflorescence, Poppy flowers, and Goodlaea flowers, 5-6-1959.

Though an attempt to find the orchid thrips *Chaetanaphothrips orchidii* Moulton proved unsuccessful, the existence in fairly good numbers of *Thrips nilgiriensis* and *Haplothrips gowdeyii* (Franklin) on orchids of different kinds was recorded. *T. nilgiriensis*, from what can be inferred from its host range, seems to be gaining importance as one of the efficient injurers of flowers, especially at altitudes, since so far as known to the author their abundance in the plains is totally negligible. They are yellow forms having close resemblance to *Thrips palmi* Karny from which they are distinguished by the difference in the number of costal bristles, which even if considered to be within the normal range of variations, could be still separated by the position of the four setae on the IX tergite which are equidistant from each other in *palmi* while in *nilgiriensis* the two median setae are twice as wide apart as the lateral one from them.

Thrips bambusae Shumsher

1945. *Thrips bambusae* Shumsher Singh in Indian J. Ent. 7 : 182-184.

NILGIRIS : Raj Bhavan Gardens 7000', numerous males and females on bamboo spindles, 11-5-1959 ; Coonoor, Sims Park 5500', numerous males and females on bamboo spindles, 10-5-1959. KODAIKANAL : Shembaganur, Sacred Heart College 5500', numerous males and females on bamboo spindles, 5-6-1959.

Thrips melaneurus Bagnall

1926. *Thrips melaneurus* Bagnall, R. S. in A. M. N. H. (9) 17 : 11.

1928. *Thrips melaneurus* Ramakrishna, T. V. in Mem. Dep. Agri. Ind., Ent. ser., (7) 10 : 262.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', numerous females on *Rosa bankia*, 11-5-1959. KODAIKANAL : Mt. St. Mary's 7500', numerous females and males on different species of rose.

This is a common species of thrips often found in the company of *Thrips florum* inhabiting rose flowers.

Thrips palmi Karny

1925. *Thrips palmi* Karny, H. H. in Bull. Deli. Proef. st. 23 : 10.

1926. *Thrips palmi* Karny, H. H. in Mem. Dep. Agri. Ind., Ent. ser., (6) 9 : 199.

1947. *Thrips palmi* Shumsher Singh in Indian J. Ent. 7 : 171.

NILGIRIS : Ootacamund, Raj Bhavan Gardens 7000', numerous females on flowers of *Lathyrus*, 11-5-1959.

***Heliothrips haemorrhoidalis* Bouche**

1833. *Heliothrips haemorrhoidalis* Bouche in Nat. Schabl. Garten Ins. : 206.

1902. *Heliothrips haemorrhoidalis* Hinds, W. E. in Proc. U.S. Nat. Mus. 26 : 168-169.

1940. *Heliothrips haemorrhoidalis* Ramakrishna, T. V. & Margabandhu, V. in Cat. Ind. Insects pt. 25 : 11-12.

NILGIRIS : Ootacamund, Botanical Gardens 7000', 2 females on grass, 11-5-1959 ; Coonoor, Pomological Station 5500', 5 females on grass, 10-5-1959. KODAIKANAL : Bryant's Park 7000', numerous females on young pine needles, 6-6-1959.

***Helionothrips kadaliphila* (Ramakrishna & Margabandhu)**

1931. *Heliothrips kadaliphila* Ramakrishna, T. V. & Margabandhu, V. in J. Bombay nat. Hist. Soc. 34 (4) : 1033.

1936. *Helionothrips kadaliphila* Priesner, H. in Proc. R. Ent. Soc. London (B) 5 : 208.

NILGIRIS : Kallar Fruit Research Station 1500', numerous females and males on plantain leaves ; Burliar Fruit Research Station 2500', numerous females and males on *Colocasia* leaves, 8-5-1959.

***Caliothrips indicus* (Bagnall)**

1913. *Heliothrips indicus* Bagnall, R. S. in A. M. N. H. (8) 12 : 291.

1934. *Heliothrips indicus* Ramakrishna, T. V. in Agr. & Livestk. Ind. 2 (4) : 397.

1940. *Heliothrips indicus* Ramakrishna, T. V. & Margabandhu, V. in Cat. Ind. Insects pt. 25 : 12.

1947. *Hercotrips indicus* Shumsher Singh in Indian J. Ent. 7 : 175.

NILGIRIS : Coonoor Pomological Research Station, 5500', 6 females on grass, 10-5-1959.

Suborder TUBULIFERA Haliday

Genus **STICTOTHRIPS** Hood

1924. *Stictothrips* Hood, J. D. in Psyche : 295.

***Stictothrips fimbriata* (Ananthakrishnan)**

1953. *Thilakothrips fimbriata* Ananthakrishnan, T. N. in Proc. R. Ent. Soc. Lond. (B) 22 (3-4) : 33-34.

NILGIRIS : Coonoor Pomological Station 5500', 1 female on grass, 10-5-1959.

Genus **HOPLOTHRIPS** Serville

1843. Serville *in* Hist. Nat. Ins. Hem. : 640.

1949. Priesner, H. *in* Bull. Soc. Fouad Ier. Entom. 33 : 86.

1957. Stannard, L. J. *in* Ill. Biol. Mon. (25) : 70-71.

The genus *Hoplothrips* is characterised by the head distinctly longer than broad, fore femora not or slightly enlarged, mouth cone long, sides straight, at least attaining mesosternum and the terminal antennal joints not forming a unit. This genus has hitherto been unrepresented in India. All the same, according to Stannard (1957), the genus *Hoplothrips* is synonymous with *Phlaeothrips* Haliday. However, pending further discussions, the genus is retained as such here.

Hoplothrips indicus sp. nov.

Macropterous female :

General body colour brownish yellow ; head, thorax, all femora except at apex, abdominal segments IV-X and antennal joints 5-8, brown; antennal joints 2 and 3, all tibia, tarsi, and apex of femora yellow ; joint 1, abdominal segments II and III yellow, shaded with brown.

Head 238 μ long, 196 μ across eyes, 182 μ across cheeks, and 168 at base, distinctly constricted at base (Fig. 3 A). Eyes 70 μ long, 75 μ wide at middle. Postoculars dilated, well developed, 64 μ long, placed 16 μ from cheeks. Ocelli placed forward, posterior ocelli beyond middle line of eyes, median ocellus at vertex not very much over-hanging. Median ocellus 19 μ in diameter, placed 13 μ from posterior ocelli, 29 μ apart and 16 μ in diameter. Antenna 8-jointed, joints 5, 6, and 7 pedicellate (Fig. 3 a) ; sense cones long and well developed ; 3¹⁺¹; 4¹⁺¹ ; 5¹⁺¹ ; 6¹⁺¹ ; antennal joints length (width) in μ : 48 (38), 64 (32), 80 (32), 83 (35), 69 (32), 64 (32), 54 (29), 32 (18). Mouth cone very long reaching just beyond the base of the prosternum, 224 μ long.

Prothorax 224 μ long at middle, as wide at anterior margin, and 223 μ at base inclusive of coxae. Prothoracic bristles moderately long, dilated. Anteroangulars 43 μ ; postangulars 58 μ ; epimerals 64 μ long. Fore femora moderately enlarged, 112 μ wide at middle, foretarsus with a triangular tooth, 16 μ long and 13 μ wide at base. Wings reaching VI abdominal segment, not constricted at middle.

Abdomen broad at base, uniformly wide across segments II-V, 448 μ ; segment VIII 322 μ wide, IX 154 μ wide ; bristles of IX outer ones long and fine, inner short and infundibuliform, 65 μ long. Tube 140 μ long,

84 μ wide at base, 56 at middle and 42 at tip. Anal setae as long as tube. Total body length 2.240 mm.

NILGIRIS : Coonoor Pomological Station 5500', female on *Lantana* flowers, 10-5-1959.

Bamboosiella bicoloripes Ananthkrishnan

1957. *Bamboosiella bicoloripes* Ananthkrishnan, T. N. in Ent. News 68 (3) : 65-68.

The discovery of more males and females of this species from bamboo spindles adds considerably to our knowledge of the range of variations of this form noted particularly for its long and thin sense cones and short mouth cone with short stylets confined only to the mouth cone.

Macropterous female :

Head 238-294 μ long from front margin of eyes, 196-210 μ wide across eyes, 203 across cheeks, and 182 at base. Posterior cheek bristle 19 μ long. Eyes 98-126 μ long, 56-84 μ wide at middle. Median ocellus 19 μ in diameter placed 22 μ from posterior ocelli, 22 μ in diameter and 32 μ apart. Postoculars 64-77 μ long, placed 29-32 μ from cheeks and 22-26 μ from posterior margin of eyes. Antennal joints length (width) in μ : 35-38 (35-38), 51-58 (26-32), 77-83 (26-32), 83-93 (36-32), 70-83 (26-32), 58-70 (26-29), 45-54 (22), 32-35 (13).

Prothorax 168-210 μ long, 168-238 μ wide at anterior margin, and 350 μ at base. Prothoracic setae : anteroangulars 32-45 μ ; midlaterals 35-48 μ ; postangulars 56 μ ; epimerals 58-64 μ long. Pterothorax 294-350 μ long and 378 μ side. Forewings 812-910 μ long ; basal wing bristles, 38 μ , 45-48 μ , and 64-78 μ long.

Bristles of abdominal segment IX : outer 173, middle 167, and inner 143 μ long. Tube 168 μ long. Total body length 1.862 to 2.492 mm.

Macropterous male :

Head, length 217-252 μ , 154-182 μ wide across eyes, and 168 at base. Eyes 91-98 μ long and 70 μ wide. Median ocellus 19 μ in diameter, placed 26 μ from posterior ocelli, 19 μ in diameter and 26 μ apart. Postoculars 54-67 μ long placed 16 μ from cheeks and 22 μ from eye margin. Antennal joints length (width) in μ : 26-29 (32), 48-51 (32), 70-77 (29-32), 75-78 (29-32), 63-70 (22-26), 48-51 (22), 45 (19), 32 (13).

Prothorax 168-182 μ long at middle, 182-210 μ wide anteriorly, and 280-308 μ at posterior margin inclusive of coxae. Anteroangulars 29-32 ; epimerals 51-57 μ long. Forewings 770-810 μ long. Bristles of IX : outer 141-144 and inner 160-172 μ long. Tube 140 μ long.

NILGIRIS : Kallar 1500', 5 females and 3 males on bamboo spindles, 9-5-1959.

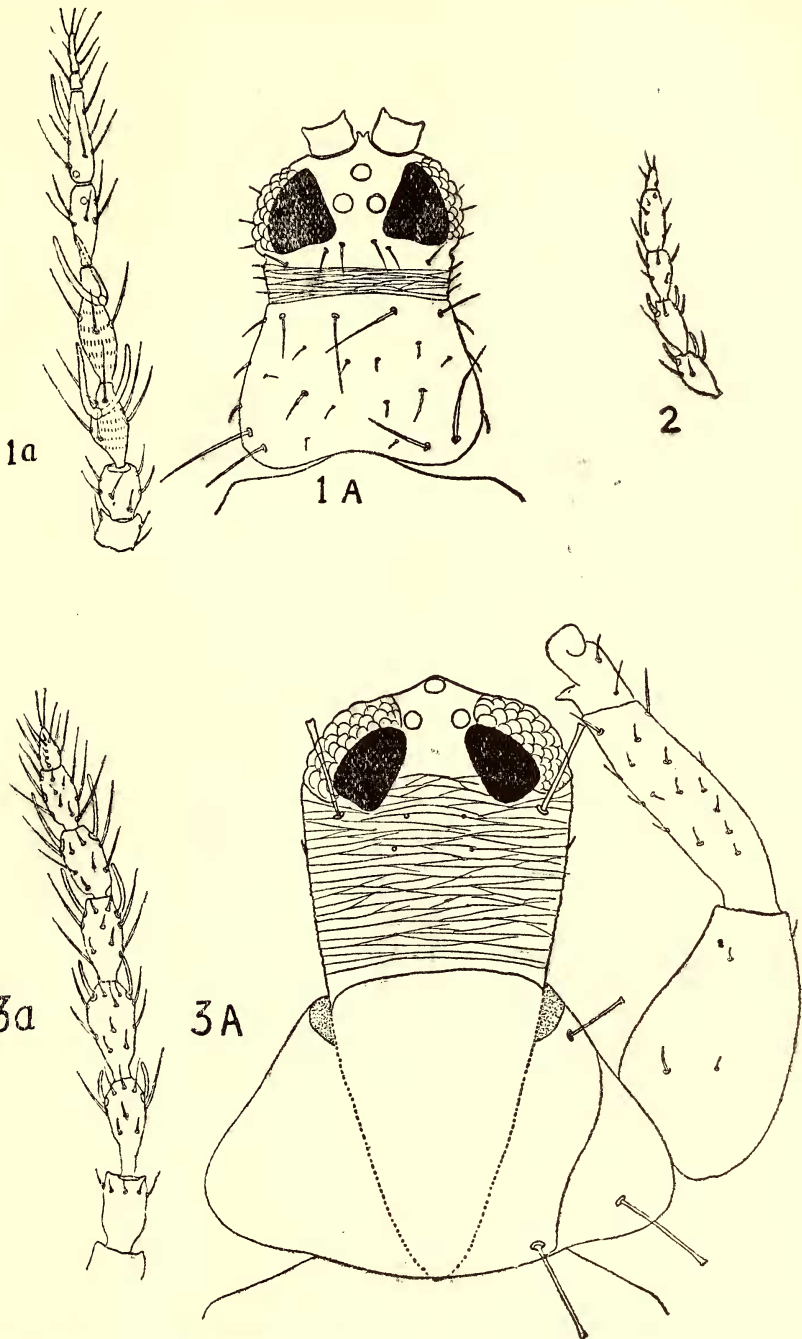


Fig. 1. *Aroidothrips longistylus* sp. n. × 110; 1A. Head and prothorax of female; 1a. Antenna of female. Fig. 2. *Bolacothrips bicolor* sp. n. × 110: Antennal joints 3-7 of female. Fig. 3. *Hoplothrips indicus* sp. n. × 110: 3A. Head, prothorax, and forelegs of female; 3a. Antenna of female.

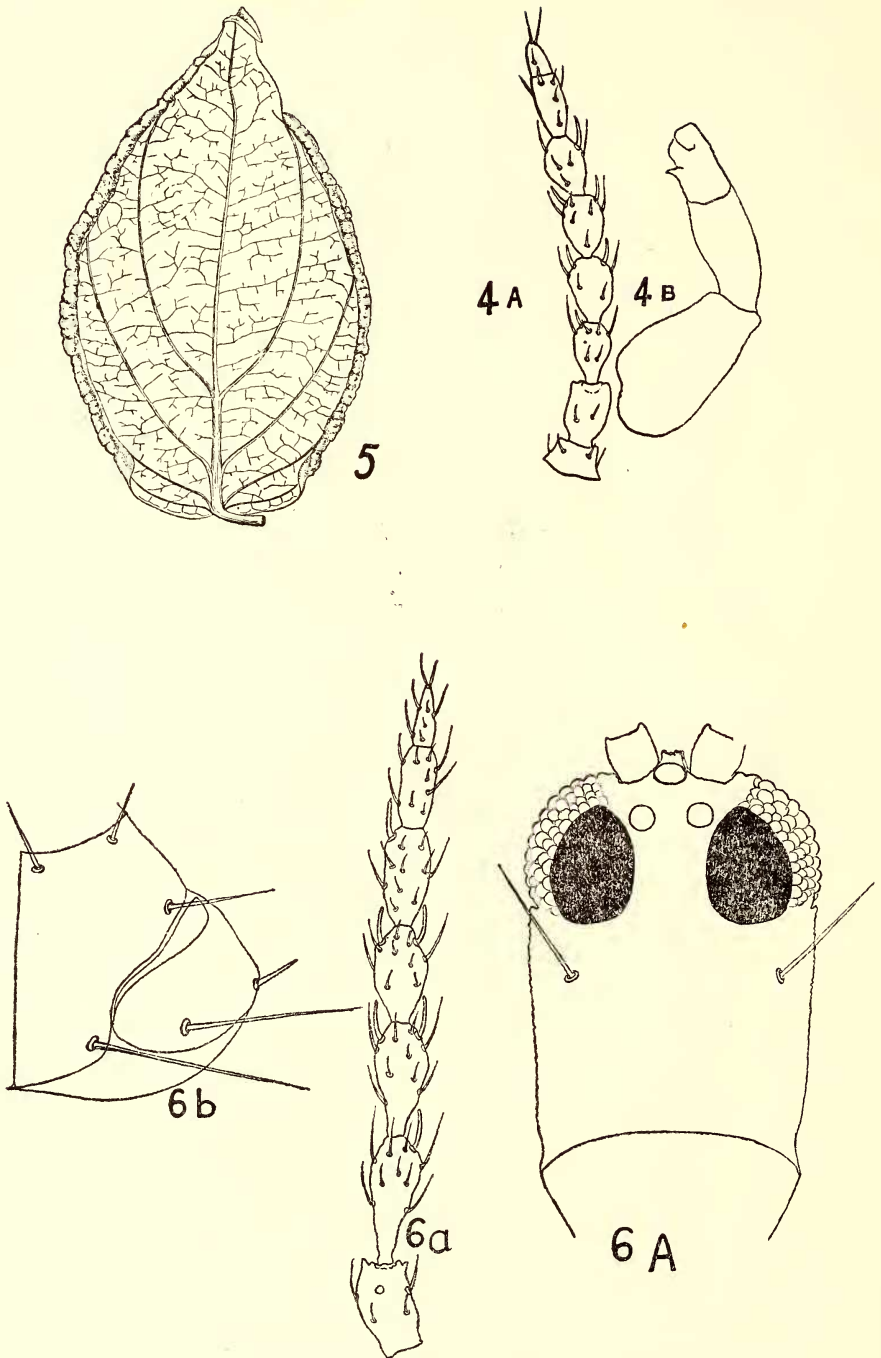


Fig. 4. *Apterygothrips pini* sp. n. $\times 110$: 4A. Antenna of female; 4B. Foreleg of female. Fig. 5. Marginal leaf gall of pepper, formed by *Gynaikothrips karnyi* Bagnall. Fig. 6. *Gynaikothrips karnyi* Bagnall $\times 110$: 6A. Head of female; 6a Antenna of female; 6b. Prothoracic chaetotaxy (one half).

Haplothrips (Trybomiella) ramakrishnai Karny

1926. *Haplothrips ramakrishnai* Karny, H. H. in Mem. Dept. Agri. Ind., Ent. ser., 9 (6) : 218.
1928. *Haplothrips ramakrishnai* Ramakrishna, T. V. in ibid. (7) : 10-292.
1931. *Haplothrips ramakrishnai* Ramakrishna, T. V. & Margabandhu, V. in J. Bombay nat. Hist. Soc. 34 (4) : 1038.
1933. *Haplothrips ramakrishnai* Priesner, H. in Rec. Ind. Mus. 25 : 361.
1957. *Haplothrips (Trybomiella) ramakrishnai* Ananthakrishnan, T. N. in Zool. Anz. 159 : 100-101.

KODAIKANAL : 6000', several males and females on flowers of *Ageratum conizoides*, a very common roadside plant. Mt. St. Mary's 7500', 10 females and 6 males in flowers of Hollyhock ; 4 females and 2 males of *Gerbera* inflorescence, 5-6-1959. Bryant's Park 7000', numerous males and females on *Canna* leaves, 5-6-1959.

It is of interest to note that only two species of *Trybomiella* are known from India, *T. ramakrishnai* and *T. apicalis* Priesner. *T. apicalis* is a typical grass-infesting form pale yellowish brown to golden brown in colour and head 1.2-1.3 times as long as wide, while *ramakrishnai* has not been recorded from grasses and is pale chestnut brown in colour with head as long as wide. Though *T. tirumalraoi* Ramk. & Marg. has been described from a single male, closer examination will reveal that it is a possible synonym of *ramakrishnai*.

Haplothrips gowdeyii (Franklin)

1908. *Anthothrips gowdeyii* Franklin, H. J. in Proc. U.S. Nat. Mus. 33 : 724.
1910. *Anthothrips gowdeyii* Bagnall, R. S. H. in Thysanoptera-Fauna Hawaiiensis 3 : 669-701.
1931. *Haplothrips gowdeyii* Priesner, H. in Bull. Soc. Roy. Ent. Egypt : 261.
1933. *Haplothrips gowdeyii* Priesner, H. in Rec. Ind. Mus. 35 : 354.
1937. *Haplothrips gowdeyii* Sakimura, K. in Proc. Haw. Ent. Soc. 9 (3) : 422.

The occurrence of this thrips in considerable numbers on a variety of plants, in particular on orchids and hollyhocks, and the damage it causes to the latter in particular are an addition to our knowledge of the bionomics of this form in India, especially when the only hitherto available data in our country is its record on *Solanum* leaves. It can be ranked as one of the commonest Tubulifera in our country and when one realises its world-wide distribution, having a very wide host range,

being extremely common in flowers of different kinds, it is difficult to imagine that its role as a major horticultural pest has been overlooked. Its importance lies in its polyphagous nature, feeding on flowers and leaves, its relative population density, and its ability to breed on most of the plants it infests. Several individuals were found in groups, feeding around the base of the ovary inside the hollyhocks. The infestation proved to be severe in the bud condition.

KODAIKANAL : Mt. St. Mary's 7500', hollyhock flowers, numerous males and females, 5-6-1959. Bryant's Park 7000', numerous individuals on leaves of Canna and grass, 5-6-1959.

Haplothrips euphorbiae Priesner

1931. *Haplothrips euphorbiae* Priesner, H. in *Miscellanea Zoologica Sumatrana* 58 : 1-4.

NILGIRIS : Kallar 1500', several males and females collected on leaves of *Euphorbia hirta*, 8-5-1959.

This species is a new record to India and is responsible for the malformation of the leaves and in extreme cases the leaves become severely damaged.

Xylaplothrips pictipes (Bagnall)

1919. *Haplothrips pictipes* Bagnall, R. S. in *A. M. N. H.* (9) 3 : 273.

1925. *Haplothrips pictipes* Ramakrishna, T. V. in *J. Bombay nat. Hist. Soc.* 30 : 868.

1928. *Haplothrips pictipes* Ramakrishna, T. V. in *Mem. Dept. Agr. Ind., Ent. ser.*, (7) 10 : 292.

1933. *Haplothrips pictipes* Priesner, H. in *Rec. Ind. Mus.* 25 (3) : 351.

1938. *Xylaplothrips pictipes* Crawford, J. C. in *Proc. Ent. Soc. Wash.* 40 (2) : 42.

NILGIRIS : Kallar Fruit Research Station 1500', 4 males and 5 females on cashew inflorescence, 8-5-1959.

Xylaplothrips Priesner has delicate, slender body form and the females of *pictipes* in this collection range between 1.204-1.498 mm. in length and the males from 1.064-1.115 mm. *X. pictipes* (Bagnall) is distinguished from *X. nayari* Ananthakrishnan by the presence of the foretarsal tooth in both the sexes.

Dolichothrips (Dolicholepta) rambhutanæ sp. nov.

Macropterous female :

General colour brown ; all tarsi, foretibia except at base, antennal joints 2-7 yellow ; rest of body brown. Wings colourless,

Head, 210-224 μ long, 168 μ wide across eyes and 154 at base, distinctly constricted at base and 1.3 times as long as wide across cheeks. Eyes 98 μ long and 70 μ wide. Ocelli well developed, median ocellus overhanging vertex, 16 μ in diameter, placed 19 μ from posterior ocelli 22 μ apart and 16 μ in diameter. Postoculars 48 μ long and blunt at tip. Antennal joints length (width) in μ : 29-32 (32), 48-51 (32), 61-64 (29-32), 64-70 (32), 54-58 (29), 48-51 (26), 45-48 (22), 26 (13). Mouth cone 182 μ long, 126 μ wide at base, 56 at middle, and 28 μ at tip, sides biconcave and tip reaching the base of prosternum. Maxillary palpi 64 μ long and labial palpi 19 μ long.

Prothorax 182-210 μ long at middle, 162-168 μ wide across anterior margin, and 266-308 μ wide at base inclusive of coxae. Prothoracic bristles, short and dilated at tip. Anteroangulars 26 μ , postangulars 32 μ , epimerals 38 μ long. Forefemora 84 μ wide at middle, foretarsus with a small, inconspicuous tooth.

Pterothorax 350 μ long and 336 μ wide at middle. Wings clear, constricted at middle, reaching VII abdominal segment with 8 duplicate cilia. Bristles on scales 42, 38, and 51 μ long respectively.

Abdomen broad at base, 322 μ wide, 280 μ wide across segment IV, 266, 224, and 112 μ wide across segments VII, VIII, and IX. All the 3 bristles of segment IX subequal, 150 μ long. Tube 168 μ long, 70, 56, and 42 μ wide at base, middle, and apex respectively; anal setae long and fine, longer than tube, 210 μ long.

Total body length 1.904-2.324 mm.

Macropterous male :

Head 224 μ long, 154 μ wide across cheeks, and 133 μ wide at base. Eyes 84 μ long and 63 μ wide. Postoculars 48 μ long. Median ocellus 13 μ in diameter, placed 16 μ from posterior ocelli, 16 μ in diameter and 29 μ apart. Antennal joints length (width) in μ : 22 (29), 45 (26), 67 (29), 67 (29), 58 (26), 54 (22), 48 (16), 29 (10). Mouth cone 98 μ wide at base and 28 μ wide at tip.

Prothorax 196 μ long at middle, 140 μ wide at anterior margin, and 280 μ wide at posterior margin. Anteroangulars 19 μ , postangulars 43, and epimerals 35 μ long. Forefemora 84 μ wide at middle with foretarsal tooth slightly more developed than in the female.

Pterothorax 294 μ wide and 308 μ long at middle. Wing scale bristles 43, 38, and 51 μ long respectively.

Abdomen long and thin, 224, 182, 126, and 98 μ wide at base, at middle, and across VIII and IX abdominal segments respectively. Bristles of IX subequal, 128 μ long. Tube 168 μ long, 56 μ wide at base; anal setae 224 μ long.

NILGIRIS : Kallar Fruit Research Station 1500', 13 females and 3 males on inflorescence of Rambhutan, 9-5-1959.

Praepodothrips indicus Priesner & Seshadri

1952. *Praepodothrips indicus* Priesner, H. & Seshadri, A.R. in Ind. Jour. Agri. Res. 22 (2) : 408-409.

KODAIKANAL : Perumalmalai Hills 5000', 4 females from sheaths of wild grass, 4-6-1959. NILGIRIS : Coonoor Pomological Station 5500', one female on perennial rye grass, 10-5-1959.

A typical grass-inhabiting form, this species is represented only in India and shows a distinct tendency towards oedemerism.

Praepodothrips priesneri Ananthakrishnan

1955. *Praepodothrips priesneri* Ananthakrishnan, T. N. in A. M. N. H. 12 (3) : 608.

NILGIRIS : Coonoor, Sim's Park 5500', 2 females on bamboo spindles, 10-5-1959.

This is a typical bamboo leaf and sheath infesting form, purely monophagous whether it be on the plains or hills.

Praepodothrips cymbopogoni Ananthakrishnan

1957. *Praepodothrips cymbopogoni* [sic] Ananthakrishnan, T. N. in Zool. Anz. 157 : 136-138.

NILGIRIS : Coonoor Pomological Station 5500', several females and males inside the leafsheath of lemon grass, *Cymbopogon citratus*, 10-5-1959.

It is of interest to note that, of the three species of *Praepodothrips*, *priesneri* and *cymbopogoni* are monophagous while *indicus* has been seen to feed on different kinds of grasses.

Genus **APTERYGOTHRIPS** Priesner

1933. Priesner, H. in Bull. Soc. Roy. Ent. Egypte : 1-3.

Body very small, wings and ocelli absent. Joint 3 of antenna short, broad at apex. Prothorax broader and shorter than head. Pterothorax narrower than prothorax including coxae. Forefemora little enlarged in the male, without teeth ; foretarsi with a distinct tooth in both the sexes, shape as in *Karnyothrips*. Tube very short, conical.

Apterygothrips pini sp. nov.

Female :

General body colour brown with yellow pigment. Antennal joints 1-2, 7-8 more brownish yellow ; joints 3-6 yellowish brown. Tube

except at apex yellow. Body with scattered red pigment. Abdominal segments with more of yellow suffused with brown.

Head 147-154 μ long from eye margin, 140 μ wide across eyes, and 140-147 μ wide across cheeks. Eyes 48 μ long, 45 μ wide at middle, being 51 μ wide at interocular region. Postoculars 35-38 μ long, slightly dilated at apex. Antenna 8-jointed (Fig. 4A), joint 3 short, with a pedicel and with one small sense cone. Antennal joints length (width) in μ : 32 (29), 45 (29), 35-38 (22), 38-43 (29), 43 (26), 38-41 (26), 43 (22), 26-29 (13). Mouth cone 98 μ long reaching just the hind margin of the prosternum, blunt.

Prothorax 140 μ long at middle, shorter than head, 168 μ wide across anterior margin, and 224 μ at base inclusive of coxae. Prothoracic bristles short, dilated at tip. Anteroangulars 16 μ ; postangulars 29; epimerals 38 and coxals 19 μ long. Pterothorax 168 μ long, 172 μ wide. Forefemora moderately enlarged, 70 μ wide, foretarsus with small tooth (Fig. 4B).

Abdomen 224 μ wide at base, 308 μ wide across segments V and VI, 140 across VIII, and 126 across IX segment. Setae on IX short and fine; outer 35-48, middle 26-32, and inner 48-60 μ long. Tube 83-90 μ long, 60 μ wide at base, 43 at middle, and 32 at tip; anal setae 80 μ long.

Total body length 1.26-1.41 mm.

Male :

General colour as in the female, more brownish. Head, thorax, and legs darker brown, as also antennal joints 3-6.

Head 140 μ long, 126 μ wide across eyes. Eyes 45-48 μ long and as wide. Postangulars 29 μ long. Antennal joints, length (width) in μ : 29 (26), 44 (26), 38 (22), 43 (26), 43 (26), 35 (22), the last two joints missing. Prothorax 126 μ wide at anterior margin, 196 at posterior margin, and 140 μ long at middle. Prothoracic bristles: anteroangulars 16 μ long; postangulars 29; epimerals 35; coxals 19 μ long. Forefemora not enlarged, 56 μ wide at middle, foretarsi with a small tooth.

Abdomen at base 196 μ wide, 98 μ across segment IX. Setae of IX: outer 45, middle 26, inner 51 μ long. Tube 86 μ long, 54 μ wide at base, 38 at middle, 29 at tip.

Total body length 1.218 mm.

KODAIKANAL: Bryant's Park 7000', 3 females and 2 males on pine needles, 4-6-1959.

Only four species of this genus have hitherto been known, *haloxyli* Priesner, *luteus* Faure, *carolinae* Faure, and *flavus* Faure. *A. pini* is very closely allied to *A. haloxyli* but is easily distinguishable by the difference in the chaetotaxy of the body and in the dilated pronotal bristles.

Gynaikothrips karnyi Bagnall

1914. *Gynaikothrips karnyi* Bagnall, R. S. in A. M. N. H. 13 : 23-31.

1952. *Gynaikothrips karnyi* Ananthakrishnan, T. N. in Indian J. Ent. 14 : 201.

Except for a casual reference to the record of 2 females by Ananthakrishnan (1952) nothing has been known about this interesting gall making thrips from India. The original reference to this species by Bagnall from leaf galls on pepper (Fig. 5) from Ceylon does not comply with modern concepts, particularly in the absence of any mention of the prothoracic chaetotaxy (Fig. 6b) especially the postangulals and the epimerals. Further, no mention is made of the sex described and, from a comparison of the several individuals at the disposal of the author, what Bagnall described appears to be a male, since the range of body length of the males in the author's collection tallies with that of Bagnall's specimen.

Macropterous female :

Total body length 2.59-2.80 mm. Head, length 280-308 μ , width across cheeks 210-224 μ . Postoculars 89-96 μ . Eyes, length 112 μ , width 84 μ . Antennal joints, length (width) μ : 48-54 (48), 64-70 (35-38), 83-93 (32), 77-86 (38), 74-80 (35), 74-83 (32-35), 64-67 (29), 45-48 (16).

Prothorax, length 196 μ , width at anterior margin 280 μ , at posterior margin 448 μ . Prothoracic bristles : anteroangulals 42-48 μ ; antero-marginals 58-64 μ ; midlateral 109 μ ; postangulals 147-153 μ ; epimeral 128-144 μ long.

Pterothorax, length 448 μ ; width at base 462 μ ; at middle 490 μ . Forewings, length 952-1008 μ , 98-126 μ wide at base, 84-98 μ at middle, and 70-84 μ at tip. Tube 210-232 μ long.

Male :

Total body length 1.92-2.18 mm. Head, length 266-280 μ ; width 196-203 μ . Postoculars 77-90 μ . Antennal joints, length (width) μ : 48-52 (43), 58-61 (32), 77-80 (32), 67-70 (32-35), 70-73 (32), 70 (29-32), 60 (26), 43 (13).

Prothorax, length 154 μ ; width at anterior margin 238 μ , at posterior margin 350 μ . Prothoracic bristles ; anteroangulals 35-38 μ , antero-marginals 45-48 μ ; midlaterals 86-92 μ . Postangulals 144 μ ; epimerals 128-134 μ . Pterothorax, length 350 μ , width 378 μ . Forewings length 994 μ ; 84, 70, and 70 μ wide at base, middle and tip. Tube length 172 μ .

NILGIRIS : Kallar 1400', Burliar 2500', numerous males and females from marginal leaf galls of pepper.